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(54) Supply Conduit

(57) A supply conduit for conveying fastening elements, in particular punch rivets or studs (8), comprises an inlet and an outlet orifice (2, 3) and a conveying duct (4 Fig 1) extending between the inlet and the outlet orifice (2, 3) in the longitudinal direction of the supply conduit and limited by a wall (5). At least one guide track (7, 12) is provided at least partially on the wall (5), the guide track having higher resistance to abrasion than the wall (5) to limit wear of the duct. Preferably, the guide track is an insert of steel, glass fibre or carbon fibre and can be of circular or polygonal e.g. triangular or rectangular cross-section. Preferably the duct is of flexible, translucent plastic and preferably extruded. Preferably the guide tracks extend the whole length of the duct and into an adaptor (13) for e.g. coupling the duct to a fastener applier.

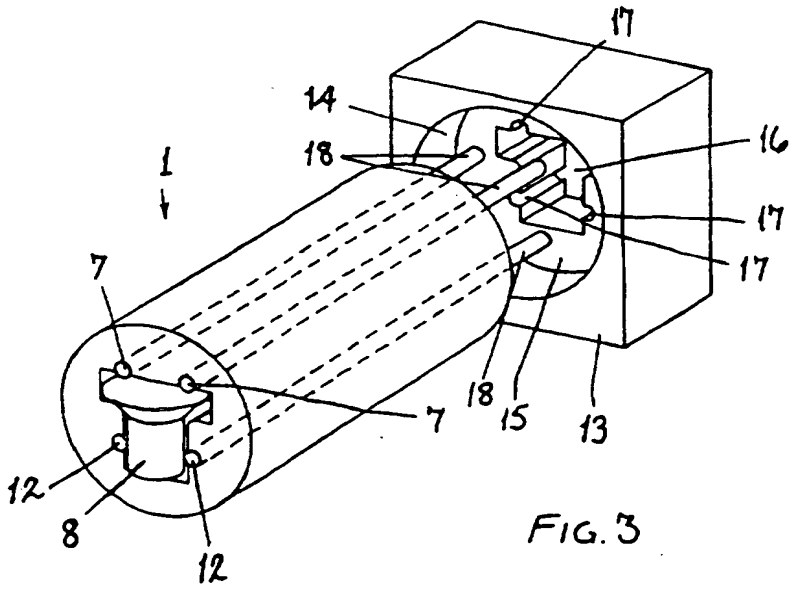

FIG. 3

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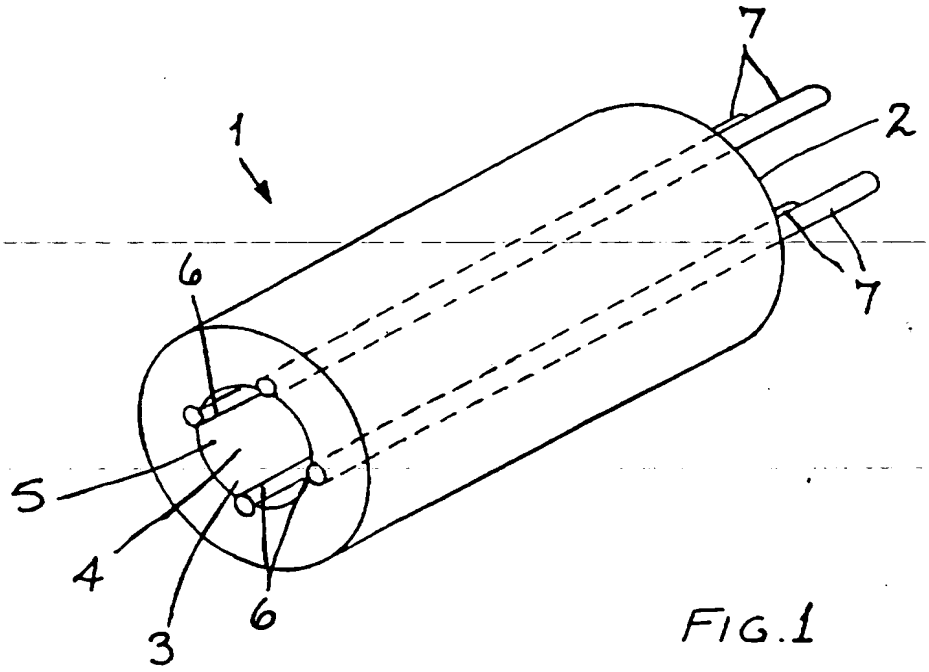

FIG.1

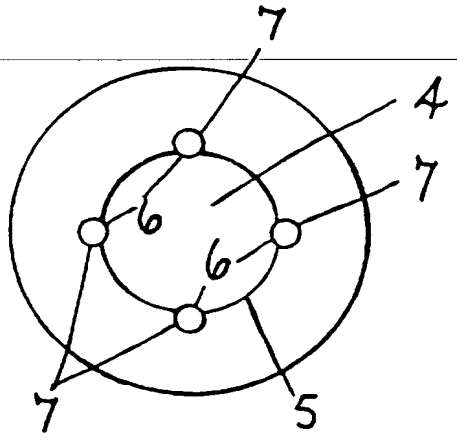

FIG.2

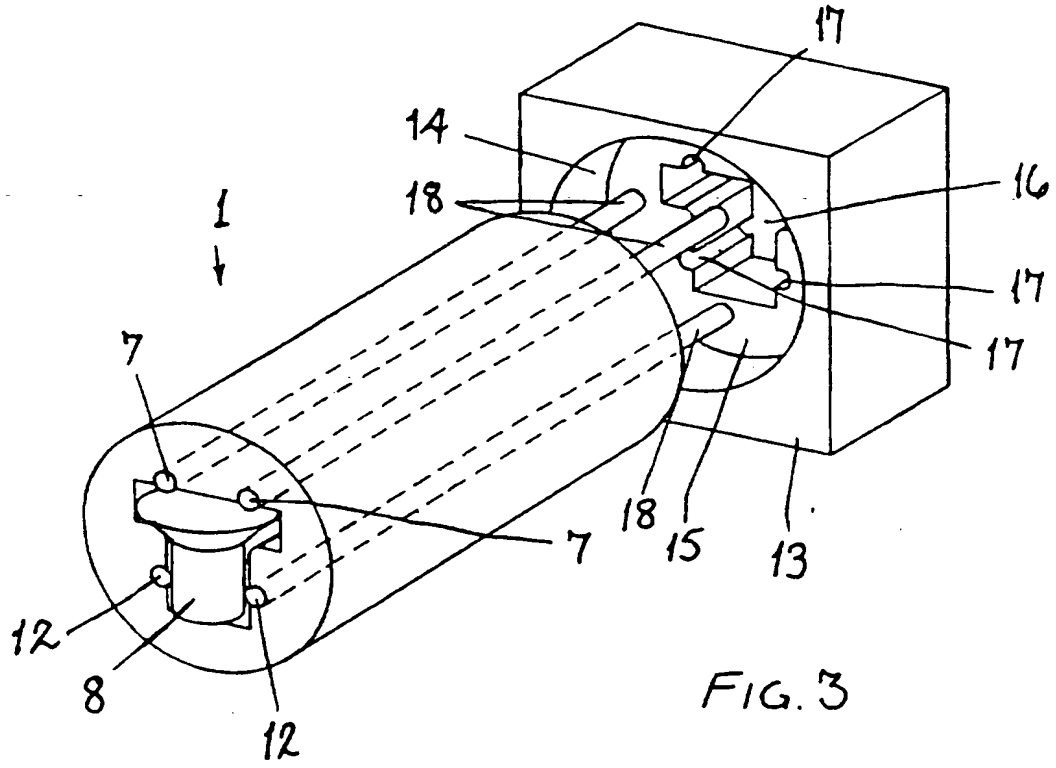

FIG. 3

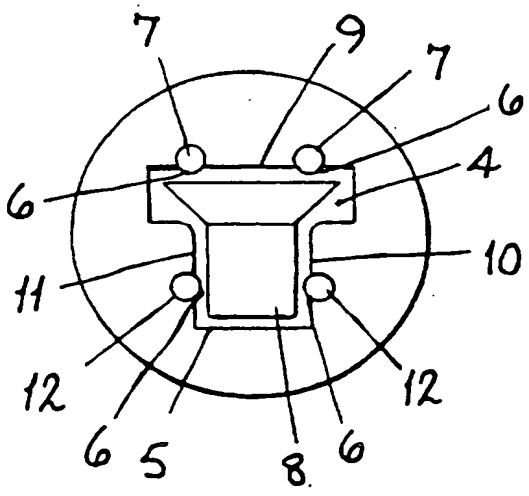

FIG. 4

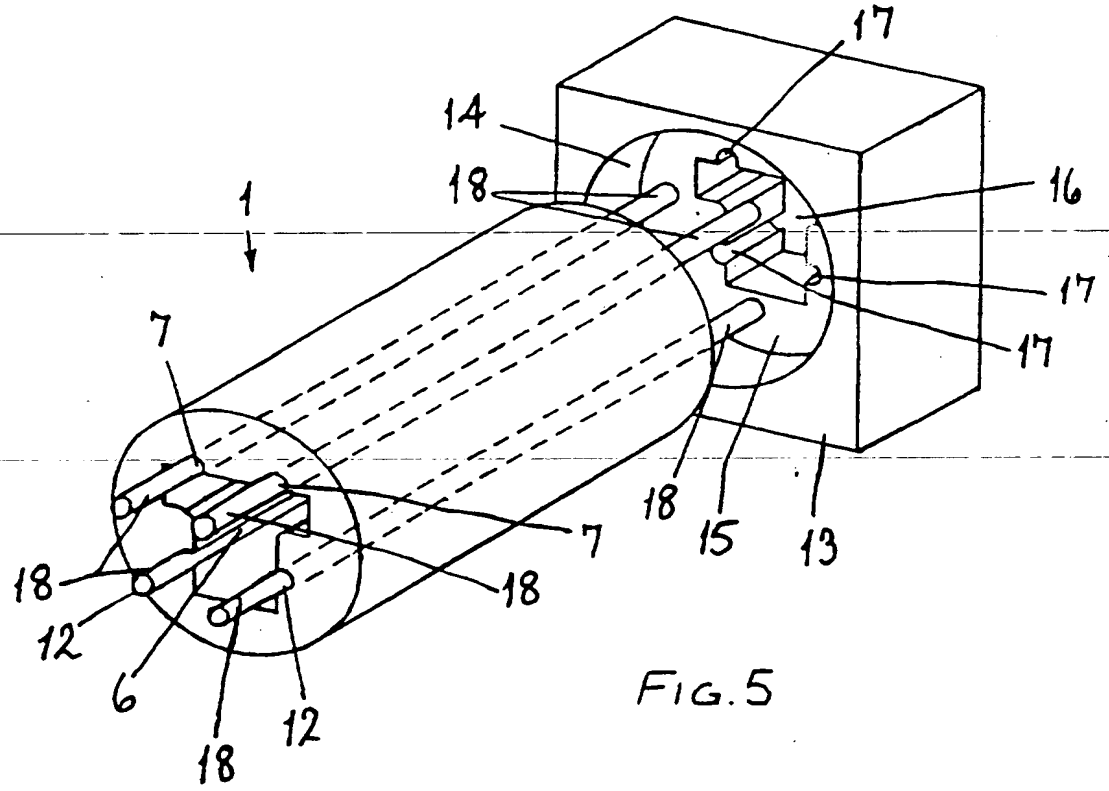

FIG.5

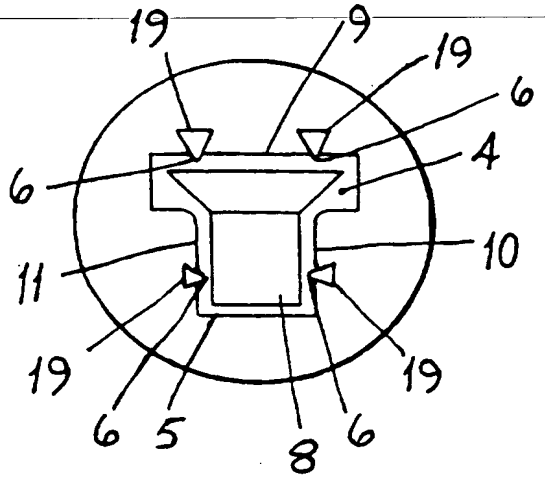

FIG.6

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SUPPLY CONDUIT WITH A GUIDE TRACE

The invention relates to a supply conduit for conveying fastening elements, in particular punch rivets or studs.

A supply conduit of this type has an inlet and an outlet orifice. A conveying duct limited by a wall extends in the longitudinal direction of the supply conduit between the inlet and outlet orifice. Known supply conduits are used to convey fastening elements, in particular punch rivets or studs or the like, from a storage container to a fastening arrangement. The fastening elements are conveyed individually within the conveying duct by means of compressed air. The cross section of the conveying duct is adapted to the fastening element. The cross section of the conveying duct is dimensioned to give a certain clearance between the wall and the fastening element so that the fastening element is conveyed within an air stream. The speed at which an individual fastening element is conveyed within a conveying duct of the supply conduit is considerable. It may happen during conveyance that the fastening element rubs partially on the wall of the conveying duct, particularly if the supply conduit is curved. The rubbing of the fastening elements causes material to be scraped from the wall. This scraped material can lead to interruptions within the fastening arrangement because the scraped material is conveyed to the fastening arrangement by the air. The scraping of material from the wall is associated with an increase in the cross section. The increase in the cross section of the conveying duct can cause a fastening element to tilt within the conveying duct and to prevent and therefore block conveyance of subsequent fastening elements.

It is an object of the present invention to develop the known supply conduit so as to avoid obstructing the conveyance of fastening elements.

The present invention provides a supply conduit with a conveying duct extending between an inlet and an outlet orifice, at least one guide track being provided at least partially on the wall of the conveying duct. The guide track has considerably higher resistance to abrasion than the wall. This measure reduces the risk of rubbing or scraping of material from the wall as the fastening elements do not pass directly against the wall during conveyance within the conveying duct but slide on the guide track.

The guide track can be formed on the entire wall of the conveying duct. The conveying duct has a coating which forms the guide track. However, this is not essential as not every portion of the wall is stressed equally strongly owing to the conditions during conveyance of the fastening element within the conveying duct. A design in which the guide track extends over the entire length of the conveying duct is preferred. According to a further advantageous idea, it is proposed that the guide track be formed by at least one insert partially embedded in the wall. Such an insert can be inserted in grooves formed in the wall. If the supply conduit is an extruded plastic conduit, it is particularly advantageous if the insert is inserted directly during extrusion of the supply conduit. This has the advantage of simplifying production of such a supply conduit. Furthermore, the embedding of the insert in the wall of the conveying duct is particularly secure.

An insert having a circular cross section is preferred. There is linear contact between the insert and a fastening element so there is only a small area of contact between the

fastening element and the insert. It is also possible to design the insert with a polygonal, preferably a triangular, or more preferably a rectangular cross section. Such cross sections are of interest, in particular, if the supply conduit is produced from a flexible material and the supply conduit is to be given a certain degree of rigidity so the supply conduit retains, for example, its curved guidance.

The insert preferably consists of a metal, preferably steel. This can be a wire or a narrow strip.

An embodiment in which the insert consists of a fibre is preferred. The insert can be formed by a glass fibre or a carbon fibre.

The cross section of the conveying duct depends on the fastening element to be conveyed and/or on the fastening arrangement to which the fastening element is conveyed for further processing as the fastening elements are to be conveyed to a fastening arrangement in this way as they already have the location necessary for the fastening device during their approach. If the conveying duct has a circular cross section, it is advantageous to provide the wall with at least three guide tracks which are preferably arranged equidistantly from one another.

As already mentioned, a supply conduit consisting of plastics material is preferred. The plastics material is preferably a translucent plastics material. This has the advantage of allowing visual checking of the supply conduit if the type of fastening element is to be exchanged. In this way, it is easy to check whether the supply conduit has been completely emptied before the supply of other fastening elements.

The supply conduit is preferably designed with an insert in such a way that the insert extends beyond the inlet and/or outlet orifice. The projecting portion of the insert can be used for positioning the supply conduit on a fastening arrangement. For this purpose, the fastening arrangement has corresponding recesses into which the projecting portions of the insert can engage. The same applies to a magazine to which the supply conduit is coupled with its inlet orifice.

A supply conduit which has an adapter at its inlet and/or outlet orifice is preferred. The adapter has the object of coupling the supply conduit, for example, to a fastening arrangement. Recesses for receiving the portion of the insert extending beyond the inlet and/or outlet orifice are provided in the adapter. It is preferable to use several unsymmetrically arranged inserts so the adapter can be clearly allocated to the supply means and the adapter cannot be arranged incorrectly. The adapter has a through orifice of which the cross section corresponds to the cross section of the supply conduit. The through orifice is aligned with the conveying duct so the fastening elements are not obstructed by the adapter as they enter or issue from the supply conduit.

The invention will be further described with reference to each of four preferred embodiments which are shown in the accompanying drawings in which;

Figure 1 is a perspective view of the first embodiment of a supply conduit;

Figure 2 is a front view of the supply conduit shown in Figure 1;

Figure 3 is a perspective view of a second embodiment of a supply conduit with an adapter;

Figure 4 is a front view of the supply conduit according to Figure 3;

Figure 5 is a perspective view of a third embodiment of a supply conduit with an adapter and

Figure 6 is a front view of a fourth embodiment of a supply conduit.

Figure 1 shows a supply conduit 1. The supply conduit 1 is a flexible conduit made of a plastics material. In the supply conduit 1 a conveying duct 4 is formed which extends between an inlet orifice 2 and an outlet orifice 3. The conveying duct 4 has a substantially circular cross section. Guide tracks 6 are provided on the wall 5 of the conveying duct 4. Each guide track 6 is formed by a wire-shaped insert 7 embedded in the wall 5. The insert 7 has a circular cross section. As shown in Figure 2, the wall has four guide tracks 6 arranged equidistantly from one another.

The inserts extend beyond the inlet orifice 2 of the supply conduit 1.

During conveyance, for example, of a stud within the conveying duct 4, the stud only comes into contact with the guide tracks 6 so that rubbing of the wall 5 is prevented.

Figures 3 and 4 show a second embodiment of a supply conduit 1 for conveying fastening elements 8. The supply conduit 1 has a conveying duct 4 which is adapted to the cross-sectional contour of the fastening element 8. The conveying duct 4 has a T-shaped cross section. Two inserts 7 are arranged with mutual spacing in the transverse wall 9. A respective insert 12 is also arranged in the mutually opposed vertical walls 10, 11 of the wall 5. The inserts 7, 12 form guide tracks 6 for the fastening element 8. The inserts 7, 12 have a circular cross section in the

embodiment illustrated. Other cross sections are also possible.

Figure 3 shows, schematically, an adapter 13 . The adapter 13 serves to couple the supply conduit 1 to a device, for example a fastening device to which the fastening element 8 is conveyed. The adapter 13 has an indentation 14 of which the cross section corresponds to the outer contour of the supply conduit 1. The indentation 14 extends over a portion of the thickness of the adapter 13 and has a contact area 15 which serves as a stop for the outlet end of the supply conduit 1. The adapter 13 also has an orifice 16 which corresponds to the contour of the conveying duct 4. Recesses 17 into which the projecting portions 18 of the insert 7, 12 can extend are formed in the adapter 13. This connection of the adapter 13 to the supply conduit 1 ensures that the orifice 16 is invariably aligned with the conveying duct 4.

The fastening element shown in Figures 3 and 4 is a countersunk rivet with a conical clinch head. During conveyance of the fastening element 8 within the conveying duct 4 by means of air, the countersunk rivet can pass to the transverse wall owing to the geometry of the clinch head and the resultant forces. To prevent wall material from being rubbed away, the two inserts 7 are provided in the transverse wall 9. The inserts 12 in the two vertical walls serve essentially to guide the countersunk rivet.

Figure 5 shows a third embodiment. This embodiment differs from the embodiment shown in Figure 3 in that the inserts 7, 12 extend from the supply conduit 1 at either end. Portions 18 of the inserts 7, 12 project at both ends of the supply conduit 1. It is not essential for all inserts provided in a supply conduit to extend beyond the

ends of the supply conduit 1. It is also possible for only a few of the inserts to project.

Figure 6 shows an embodiment in which the inserts differ from the inserts shown in Figures 3 to 5. The inserts 19 have a triangular cross section. A tip of the triangular inserts 19 forms the guide track 6. The tip is preferably rounded to avoid forming furrows on the fastening element during conveyance.

The positions at which inserts are to be introduced into the wall 5 of the conveying duct 4 depend substantially on the forces resulting from the geometry of the fastening element and the flow conditions within the conveying duct 4. In the case of a semicircular rivet which is conveyed transversely to its longitudinal axis, it is preferable to provide guide tracks which are arranged beneath the head on either side of the shaft.

The supply conduit 1 is extruded from a plastics material. The external cross-sectional configuration of the supply conduit 1 is optional. It is preferably circular. A supply conduit of which the external cross-sectional configuration corresponds to the cross-sectional configuration of the conveying duct is preferred. A uniform wall thickness of the supply conduit can thus be achieved. This is of particular interest if the wall thicknesses are relatively small owing to the shrinkage of the extruded supply conduit. The inserts 7, 12 are inserted simultaneously during extrusion of the supply conduit 1 so that a supply conduit with the inserts is formed in a single production stage. Under certain circumstances, it may be desirable for specific conditions of use to introduce the inserts into the wall of the conveying duct at a later stage. Appropriate grooves can be shaped during the

extrusion process for this purpose. The inserts in the supply conduits can also be exchangeable in design. The portions 18 can be used to place a tool thereon and to remove the inserts from the groove in the wall of the conveying duct. If the inserts are made of metal, a new insert can be connected to the old insert, for example by soldering or welding, at the opposite end of the supply conduit, so the new insert is drawn in as the old insert is removed.

CLAIMS

1 Supply conduit for conveying fastening elements, in particular punch rivets or studs, with an inlet and an outlet orifice (2, 3) and a conveying duct (4) extending between the inlet and the outlet orifice (2, 3) in the longitudinal direction of the supply conduit and limited by a wall (5), characterised in that at least one guide track (6) is provided at least partially on the wall (5), the guide track (6) having higher resistance to abrasion than the wall (5).

2 Supply conduit according to claim 1, characterised in that the guide track (6) extends over the entire length of the conveying duct (4).

3 Supply conduit according to claim 1 or 2, characterised in that the guide track (6) is formed by at least one insert (7, 12) partially embedded in the wall (5).

4 Supply conduit according to claim 3, characterised in that the insert (7, 12) has a circular cross section.

5 Supply conduit according to claim 3, characterised in that the insert (7, 12) has a polygonal, preferably a triangular, in particular a rectangular cross section.

6 Supply conduit according to one of claims 3 to 5, characterised in that the insert (7, 12) consists of a metal, preferably of steel.

7 Supply conduit according to one of claims 3 to 5, characterised in that the insert (7, 12) consists of a

fibrous material, and is preferably a glass fibre, carbon fibre.

8 Supply conduit according to one of claims 1 to 7, characterised in that the conveying duct (4) has a circular cross section and the wall (5) is provided with at least three guide tracks (6) which are preferably arranged equidistantly from one another.

9 Supply conduit according to one of claims 1 to 8, characterised in that it is flexible.

10 Supply conduit according to one of claims 1 to 9, characterised in that it consists of a preferably translucent plastics material.

11 Supply conduit according to claim 10, characterised in that it is extruded.

12 Supply conduit according to one of claims 3 to 11, characterised in that the insert (7, 12) extends beyond the inlet and/or outlet orifice (2, 3).

13 Supply conduit according to claim 12, characterised in that it has, on its inlet and/or outlet orifice (2, 3), an adapter (13) having recesses (17) for receiving the portion of the insert (7, 12) extending beyond the inlet and/or outlet orifice (2, 3).

The Patent Office

Application No:	GB 9607860.5	**Examiner:**	Dave McMunn
Claims searched:	1-13	**Date of search:**	4 June 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B8S (SBL). B8A (A3AS, A3AT, A3AX).

Int Cl (Ed.6): B65G 11/00, 11/16.

Other: ONLINE: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2,038,264 A	(P M F). Note guides 32-38, Fig 3	1-4,6
X	GB 0,983,180	(BOURNE). Note guides 2	1,2,5,6
X	EP 0,239,660 A1	(KAWAMOTO). See Fig 8	1,2,4-8
X	US 4,795,018	(ANDERSON). Note guides 34, 46	1,2,4,6
X	US 4,418,813	(LEINENGER). One example of a number of this type - Note wear guides	1,2,4-6

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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